WATER-QUALITY DATA FOR 34 SITES, APRIL AND JUNE 1984, NEAR THE Y-12 PLANT, THE OAK RIDGE RESERVATION, TENNESSEE

Pamela J. Pulliam

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Dallas L. Peck, Director

For additional information
write to:

District Chief
U.S. Geological Survey
A-413 Federal Building
U.S. Courthouse
Nashville, Tennessee 37203

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FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM OF UNITS (SI)

Multiply	by	To obtain
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
foot (ft)	0.3048	meter (m)
acre	0.4047	square hectometer (hm^2)
square mile (mi^2)	2.590	square kilometer (km^2)
mile (mi)	1.609	kilometer (km)
picocuries (pCi)	27.0	disintegrations per second

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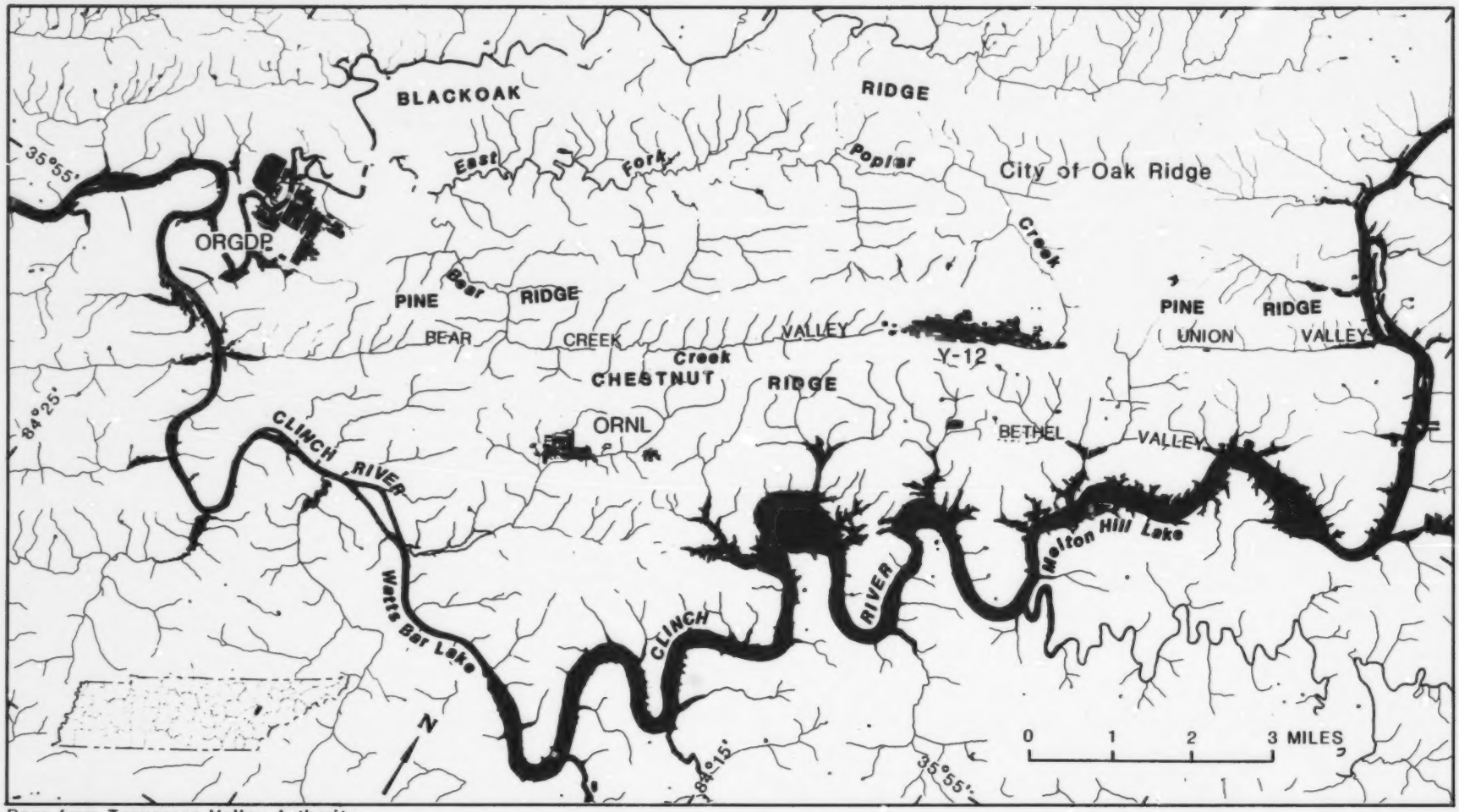
ABSTRACT

Water-quality data were collected at 34 sites in the vicinity of the Y-12 Plant, Oak Ridge, Tennessee, on April 12 and 13, 1984. Concentrations of dissolved major and trace constituents were determined; field determinations of specific conductance, pH, temperature, alkalinity, and dissolved oxygen were made. Gross alpha and beta activity were determined for 10 of the 34 sites sampled in April, and concentrations of dissolved organic carbon and oil and grease were determined for 11 sites sampled on June 3, 1984.

INTRODUCTION

Water-quality data were collected on April 12 and 13, 1984, during high base flow by the U.S. Geological Survey in watersheds near the Y-12 Plant at the Oak Ridge Reservation, Tenn. (fig. 1). The watersheds range in size from 0.33 to 5.92 mi^2. Concentrations of dissolved major and trace constituents were determined; field determinations of specific conductance, pH, temperature, alkalinity, and dissolved oxygen were made. This data collection is part of a study done in cooperation with the Department of Energy. The purpose of the study is to describe the regional ground-water flow system and to determine the extent of any effects on ground-water quality resulting from activities at the Y-12 Plant.

The major sources of contamination in the vicinity of the Y-12 Plant are the S-3 ponds, located at the headwaters of Bear Creek at the eastern end of the valley, and the Bear Creek burial grounds and oil landfarm, located north of Bear Creek, southwest of the S-3 ponds (fig. 2). Because a significant part of the flow in the streams is comprised of ground water, determining the quality of water from these streams may indicate the extent of ground-water contamination and the direction of regional ground-water flow.



Base from Tennessee Valley Authority
1:24,000 map S-16A, revised in part June 1974

Figure 1.--Study area.

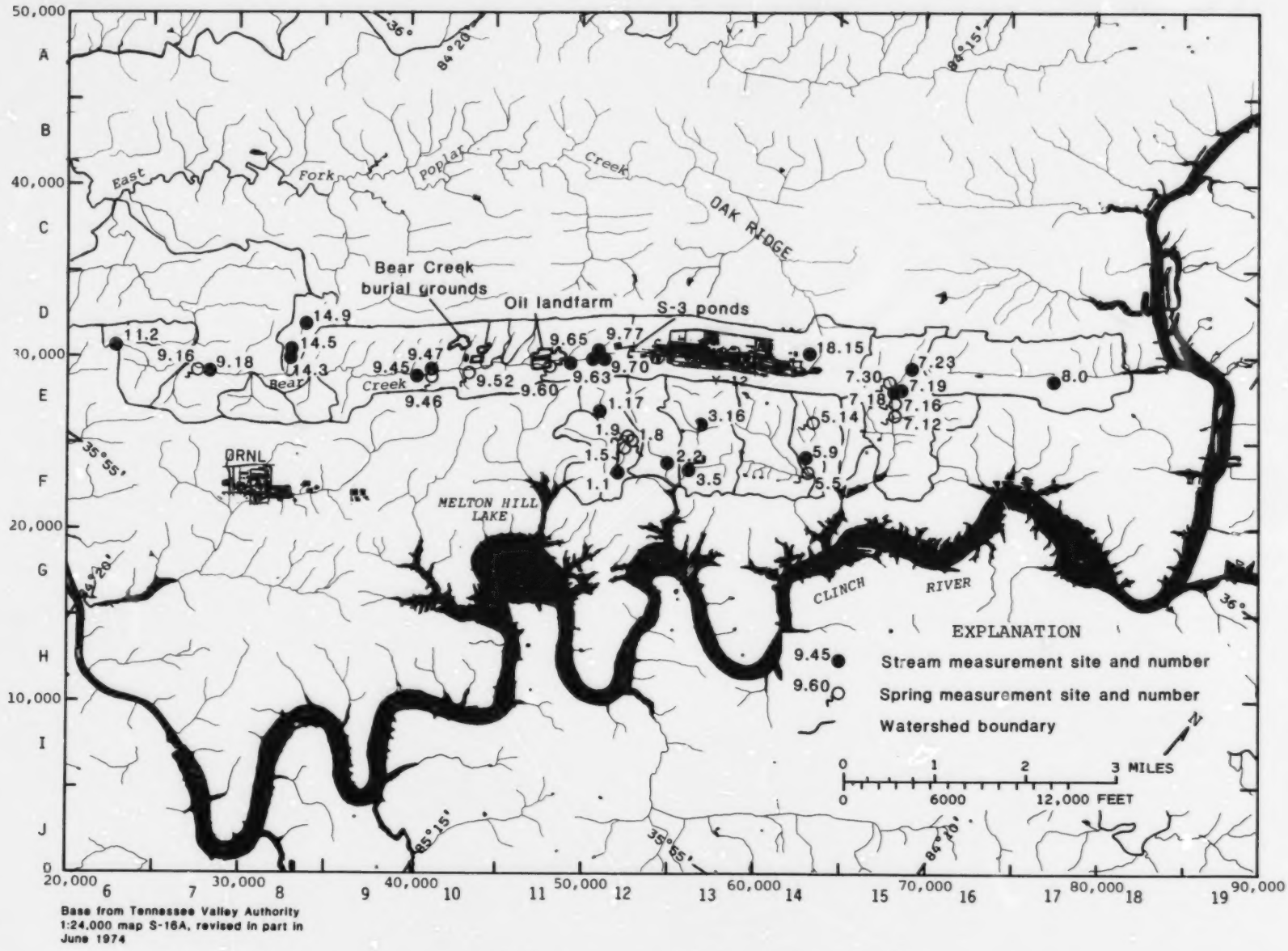


Figure 2.--Sampling sites.

DESCRIPTION OF THE AREA

The Oak Ridge Reservation includes 58,000 acres in the west-central part of East Tennessee, and is bounded on the northeast, southeast, and southwest by the Clinch River, and on the northwest by Blackoak Ridge (McMaster, 1967, p. N2). The three major facilities in the area are X-10, the Oak Ridge National Laboratory (ORNL), a research and development center; Y-12, a research, development, and production center; and K-25, the Gaseous Diffusion Plant (ORGDP), a production facility (fig. 1).

The Oak Ridge Reservation is in the Valley and Ridge physiographic province (Miller, 1974). Ordovician and Cambrian rocks that underlie the Valley and Ridge are predominately carbonate, siltstone, shale, and some sandstone.

The water-quality data were collected at sites on Pine and Chestnut Ridges, and in Bethel and Bear Creek Valleys. Pine Ridge, underlain by the sandstone and shale of the Rome Formation, and Chestnut Ridge, underlain by the siliceous dolomite of the Knox Group, are northeast-trending at altitudes of 1,000 to 2,000 feet. Bear Creek and Bethel Valleys are generally flat at altitudes of 750 to 850 feet and are underlain by shale of the Conasauga Group and by limestone and shale of the Chickamauga Group, respectively.

APPROACH

The 34 water-quality sites were selected based upon the specific conductance and discharge values obtained for 18 watersheds during the period February 15 through April 9, 1984 (Evaldi, 1984). Locations and identification numbers of the sites are shown on figure 2. The whole number part of the site number indicates the watershed in which the site is located, and the decimal part is a sequential number within the watershed. The sites were chosen to satisfy two purposes: (1) to collect background water-quality data to represent the various rock types, and (2) to identify locations of contaminated groundwater input to surface water.

The headwaters of watersheds 1, 2, 3, and 5 and the lower reach of 7 drain the Knox Group, the downstream reaches of 1, 2, 3, and 5 drain the Chickamauga Group. The headwaters of 7, and watersheds 8, 9, 11, and 18, drain the Conasauga Group. The headwaters of watershed 14 drain the Rome Formation and the lower stream reach drains the Conasauga Group.

Site numbers, Oak Ridge (S16A grid) coordinates, latitudes, longitudes, and downstream order numbers are listed in table 1. The purpose of sampling a particular site and the rock unit affecting the site are also listed.

Table 1.--Sampling locations

[A, Sample believed to be affected by human activity; B, Sample believed to be representative of background conditions; CH, Chickamauga Group; CO, Conasauga Group; K, Knox Group; R, Rome Formation]

Site number	SI6A grid coordinates North	East	Latitude	Longitude	Downstream order number	Purpose	Rock unit
8.0	N28580	E77420	360046	0841157	03534880	A	CO
7.23	N29405	E69175	360007	0841325	03535076	B	CO
7.19	N28055	E68285	355950	0841326	03535080	A	CO
7.30	N28550	E67850	355953	0841333	03535082	A	CO
7.18	N28050	E68125	355950	0841327	03535084	A	CO
7.16	N27320	E68177	355944	0841322	03535087	B	K
7.12	N26580	E68153	355938	0841316	03535090	B	K
5.14	N26175	E63375	355909	0841402	03535105	A	K
5.9	N24205	E62940	355850	0841353	03535110	A	CH,K
5.5	N23310	E63095	355843	0841345	03535120	B	CH
3.16	N26065	E56875	355853	0841508	03535590	A	K
3.5	N23420	E56180	355805	0841455	03535598	A	CH
2.2	N23925	E54880	355802	0841512	03535615	A	CH
1.17	N26845	E51100	355805	0841610	03535636	B	K
1.9	N25280	E52645	355802	0841543	03535639	B	K
1.8	N25170	E52775	355801	0841541	03535641	A	K
1.5	N24720	E52370	355756	0841541	03535643	B	K,CH
1.1	N23300	E52025	355741	0841537	03535648	B	CH
18.15	N30718	E63200	355941	0841431	03538233	A	CO
9.70	N29906	E51238	355831	0841629	03538253	A	CO
9.77	N30450	E50918	355836	0841635	03538254	A	CO
9.65	N29920	E50560	355828	0841637	03538255	A	CO
9.63	N29583	E49117	355817	0841649	03538256	A	CO
9.60	N29425	E48085	355808	0841653	03538257	B	CO
9.52	N29038	E43342	355739	0841742	03538259	A	CO
9.47	N28940	E41240	355728	0841803	03538260	A	CO
9.46	N28805	E41168	355726	0841803	03538261	B	CO
9.45	N28925	E40315	355722	0841813	03538262	A	CO
9.18	N29175	E28167	355616	0842017	03538268	A	CO
9.16	N29180	E27550	355614	0842022	03538269	B	CO
14.3	N29920	E33043	355649	0841932	03538266	B	CO
14.5	N30250	E33060	355652	0841934	03538267	B	CO
14.9	N31906	E33943	355711	0841937	03538265	B	R
11.2	N30650	E22846	355558	0842120	03538271	B	CO

EXPLANATION OF DATA

A listing of the water-quality parameters collected in the vicinity of the Y-12 facility is shown in table 2. The samples collected on April 12 and 13 were analyzed for all the listed parameters with the exception of dissolved organic carbon and oil and grease, which were obtained on June 3, 1984.

Table 2.--Water-quality parameters determined

Field:

- Water temperature
- Specific conductance
- pH
- Alkalinity
- Dissolved oxygen

Laboratory:

Major constituents (dissolved) or properties:

- Calcium
- Magnesium
- Sodium
- Potassium
- Alkalinity
- Chloride
- Sulfate
- Nitrogen
- Phosphorus
- Residue on evaporation

Trace constituents (total recoverable) and compounds:

Barium	Copper	Lithium	Strontium
Beryllium	Cyanide	Manganese	Uranium
Cadmium	Iron	Mercury	Vanadium
Chromium	Lead	Molybdenum	Zinc
Cobalt			

Other parameters:

- Gross alpha (dissolved and suspended)
- Gross beta (dissolved, total, and suspended)
- Dissolved and total organic carbon
- Oil and grease

Field Analyses: Measurements of temperature, specific conductance, pH, dissolved oxygen, alkalinity, and streamflow were made at each site at the time of sample collection (table 3). In some cases insufficient flow prevented measurement of discharge and (or) dissolved oxygen. Temperature, specific conductance, and discharge were determined on June 3.

Table 3.--Field analyses

Site number	Date	Temperature (° C)	Specific conductance (µS/cm)	pH	Alkalinity field (mg/L as $CaCO_3$)	Oxygen, dissolved (mg/L)	Discharge instantaneous (ft^3/s)
8.0	4/12/84	13.0	318	7.1	128	--	--
7.23	4/12/84	10.0	85	6.0	--	9.2	0.05
	6/ 3/84	17.0	105	--	--	--	.01
7.19	4/12/84	15.0	460	7.3	198	7.0	.19
	6/ 3/84	16.0	660	--	--	--	.07
7.30	4/12/84	12.5	400	7.1	198	5.5	.07
7.18	4/12/84	14.0	380	7.5	186	10.4	.25
	6/ 3/84	15.5	425	--	--	--	.22
7.16	4/12/84	15.0	282	7.4	156	8.2	.32
7.12	4/12/84	14.0	232	7.4	140	7.2	.19
5.14	4/12/84	13.0	183	7.0	--	7.7	.16
5.9	4/12/84	14.0	262	8.0	--	8.2	.88
5.5	4/13/84	14.0	245	7.4	100	8.0	.13
3.16	4/12/84	12.5	360	7.2	--	--	.27
3.5	4/12/84	12.0	324	8.7	--	12.6	3.1
2.2	4/13/84	16.5	200	8.0	96	9.0	<.01
	6/ 3/84	20.0	225	--	--	--	.01
1.17	4/12/84	15.0	115	7.3	54	8.9	.14
1.9	4/12/84	12.0	158	6.7	77	9.2	.47
1.8	4/12/84	12.0	240	6.7	111	7.9	.02
1.5	4/13/84	12.5	225	6.8	111	8.2	.37
1.1	4/12/84	14.5	190	7.7	94	10.2	.87
18.15	4/12/84	15.5	780	8.0	--	13.4	.00
	6/ 3/84	18.5	800	--	--	--	<.01
9.70	4/13/84	11.0	4,000	6.6	--	1.6	.02
	6/ 3/84	15.0	3,900	--	--	--	<.01
9.77	4/13/84	14.0	86	6.8	--	9.2	.08
	6/ 3/84	21.0	145	--	--	--	.01
9.65	4/13/84	13.0	2,300	5.9	--	8.9	.11
9.63	4/13/84	17.0	1,800	7.6	--	9.0	.29
	6/ 3/84	22.0	2,600	--	--	--	.07
9.60	4/13/84	14.0	240	7.5	--	9.0	.14
9.52	4/12/84	13.0	530	7.2	--	4.3	.21
9.47	4/12/84	16.0	540	8.1	--	10.4	1.3
	6/ 3/84	16.0	780	--	--	--	.13
9.46	4/12/84	14.0	360	7.2	--	6.6	.75
9.45	4/12/84	11.0	480	7.7	--	10.2	1.9
9.18	4/12/84	15.0	320	8.5	--	10.0	4.3
	6/ 3/84	14.5	420	--	--	--	1.2
9.16	4/12/84	12.0	221	7.3	--	9.6	.71
14.3	4/12/84	16.0	68	7.8	--	10.5	.21
	6/ 3/84	14.0	123	--	--	--	.04
14.5	4/12/84	11.0	47	9.2	--	9.8	.03
14.9	4/12/84	9.5	48	8.3	--	10.0	.10
11.2	4/12/84	13.0	35	6.0	7	7.8	.01

Laboratory Analyses: The water-quality data collected during April and June are listed in table 4. Samples were filtered through a 0.45 micrometer membrane filter at the time of collection. Trace constituent and oil and grease concentrations were determined from unfiltered samples (table 5). These analyses were done by the U.S. Geological Survey Central Laboratory, Doraville, Georgia, using methods described in Skougstad and others (1979) and Goerlitz and Brown (1972). The radionuclides (table 6) were determined at the Geological Survey Central Laboratory in Denver, Colorado, using methods described in Thacker and others (1977).

Table 4.--Major constituents and properties

Site number	Date of sample	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Alkalinity lab (mg/L as $CaCO_3$)	Chloride, dissolved (mg/L as Cl)	Sulfate dissolved (mg/L as SO_4)	Nitrogen, NO_2+NO_3 dissolved (mg/L as N)	Phosphorus, dissolved (mg/L as P)	Solids residue at 180 °C dissolved (mg/L)
8.0	4/12/84	43	11	3.3	1.7	122	2.5	43	.560	<.010	173
7.23	4/12/84	8.6	2.7	2.5	1.5	31	1.3	11	<.100	<.010	64
7.19	4/12/84	41	15	15	9.6	198	24	8.9	.190	<.010	270
7.30	4/12/84	70	6.7	2.6	1.5	194	4.1	17	.950	<.010	256
7.18	4/12/84	56	11	4.6	1.6	179	9.4	16	.690	<.010	231
7.16	4/12/84	31	18	.90	.60	156	2.0	4.0	.320	<.010	184
7.12	4/12/84	28	16	.70	.70	139	1.6	2.2	.170	<.010	159
5.14	4/12/84	19	11	.50	.90	93	1.4	2.7	.460	.050	127
5.9	4/12/84	30	13	.70	1.0	133	1.8	4.5	.510	.010	166
5.5	4/13/84	39	5.2	1.4	.60	118	3.9	6.7	.290	<.010	153
3.16	4/12/84	41	13	2.5	4.5	143	2.7	34	.100	.030	231
3.5	4/12/84	40	9.7	3.3	3.1	111	3.8	48	<.100	.080	204
2.2	4/13/84	26	7.9	1.6	.80	96	3.1	6.5	.240	<.010	133
1.17	4/12/84	11	6.3	.70	.90	55	1.9	3.2	<.100	.010	85
1.9	4/12/84	18	7.8	1.0	.80	78	2.2	3.7	<.100	<.010	112
1.8	4/12/84	27	11	1.4	.60	113	4.5	6.0	<.100	<.010	151
1.5	4/13/84	27	10	.60	.50	111	1.8	5.9	<.100	.080	141
1.1	4/12/84	23	8.8	.90	.60	94	2.1	4.4	<.100	<.010	121
18.15	4/12/84	130	20	5.7	3.0	358	16	87	.320	<.010	544
9.70	4/13/84	530	75	180	9.7	314	220	190	300	<.010	--
9.77	4/13/84	9.8	2.1	2.8	1.2	26	3.5	11	3.90	<.010	--
9.65	4/13/84	350	39	23	2.9	26	19	9.2	280	<.010	--
9.63	4/13/84	270	35	39	4.4	140	47	58	210	<.010	--
9.60	4/13/84	27	16	.60	.40	139	1.6	1.1	<.100	.020	156
9.52	4/12/84	81	20	9.1	1.7	199	20	24	20.0	<.010	414
9.47	4/12/84	73	12	9.9	2.1	107	20	25	30.0	<.010	417
9.46	4/12/84	45	13	4.2	1.1	133	9.9	12	9.90	<.010	232
9.45	4/12/84	62	13	7.1	1.6	120	15	19	22.0	<.010	343
9.18	4/12/84	41	9.7	4.5	1.4	102	10	13	9.20	<.010	210
9.16	4/12/84	28	9.0	2.0	.80	112	4.0	3.2	.150	<.010	146
14.3	4/12/84	6.4	1.9	2.0	1.8	12	1.2	10	<.100	.050	42
14.5	4/12/84	5.0	1.2	1.5	1.0	13	1.4	11	<.100	<.010	--
14.9	4/12/84	3.7	1.4	1.2	2.3	9.0	1.3	12	<.100	<.010	26
11.2	4/12/84	2.6	1.0	1.1	.90	7.0	1.2	7.7	<.100	<.010	20

Table 5.--Trace constituents and compounds

Site Number	Date of sample	Barium, total recoverable (µg/L as Ba)	Beryllium, total recoverable (µg/L as Be)	Cadmium total recoverable (µg/L as Cd)	Chromium, total recoverable (µg/L as Cr)	Copper, total recoverable (µg/L as Cu)	Cyanide total (mg/L as CN)	Iron, total recoverable (µg/L as Fe)	Lead, total recoverable (µg/L as Pb)	Lithium total recoverable (µg/L as Li)
8.0	4/12/84	<100	<10	<1	3	2	<.01	200	1	10
7.23	4/12/84	<100	<10	<1	2	1	<.01	710	1	<10
	6/ 3/84	--	--	--	--	--	--	--	--	--
7.19	4/12/84	200	<10	1	3	4	<.01	180	4	10
	6/ 3/84	--	--	--	--	--	--	--	--	--
7.30	4/12/84	<100	<10	<1	1	1	<.01	230	1	<10
7.18	4/12/84	100	<10	<1	3	2	<.01	190	3	10
	6/ 3/84	--	--	--	--	--	--	--	--	--
7.16	4/12/84	<100	<10	<1	3	1	<.01	100	2	10
7.12	4/12/84	<100	<10	<1	2	1	<.01	170	1	<10
5.14	4/12/84	<100	<10	<1	3	1	<.01	210	3	<10
5.9	4/12/84	<100	<10	<1	3	2	<.01	120	5	20
5.5	4/13/84	<100	<10	<1	<1	1	<.01	190	2	<10
3.16	4/12/84	100	<10	<1	3	1	<.01	1600	5	90
3.5	4/12/84	100	<10	<1	7	4	<.01	290	5	90
2.2	4/13/84	<100	<10	<1	1	2	<.01	250	1	10
	6/ 3/84	--	--	--	--	--	--	--	--	--
1.17	4/12/84	<100	<10	<1	2	1	<.01	130	1	<10
1.9	4/12/84	<100	<10	3	4	3	<.01	300	4	10
1.8	4/12/84	<100	<10	<1	4	1	<.01	180	2	10
1.5	4/12/84	<100	<10	<1	2	2	<.01	90	3	<10
1.1	4/12/84	<100	<10	<1	2	1	<.01	220	1	<10
18.15	4/12/84	500	<10	1	12	29	<.01	31000	73	20
	6/ 3/84	--	--	--	--	--	--	--	--	--
9.70	4/13/84	<100	<10	<1	30	2	<.01	740	6	<10
	6/ 3/84	--	--	--	--	--	--	--	--	--
9.77	4/13/84	<100	<10	<1	4	2	<.01	740	6	<10
	6/ 3/84	--	--	--	--	--	--	--	--	--
9.65	4/13/84	2400	<10	58	1	2	.06	240	2	<10
9.63	4/13/84	800	<10	27	4	2	.06	120	4	20
	6/ 3/84	--	--	--	--	--	--	--	--	--
9.60	4/13/84	100	<10	<1	2	1	<.01	100	2	<10
9.52	4/12/84	100	<10	<1	2	2	<.01	150	1	20
9.47	4/12/84	200	<10	1	1	2	.01	480	1	350
	6/ 3/84	--	--	--	--	--	--	--	--	--
9.46	4/12/84	<100	<10	<1	2	1	<.01	100	2	20
9.45	4/12/84	200	<10	1	2	2	<.01	210	1	210
9.18	4/12/84	100	<10	<1	2	3	<.01	240	1	90
	6/ 3/84	--	--	--	--	--	--	--	--	--
9.16	4/12/84	<100	<10	<1	3	2	<.01	360	5	10
14.3	4/12/84	<100	<10	<1	1	2	<.01	410	2	<10
	6/ 3/84	--	--	--	--	--	--	--	--	--
14.5	4/12/84	<100	<10	<1	5	3	<.01	940	4	10
14.9	4/12/84	<100	<10	<1	3	2	<.01	270	3	<10
11.2	4/12/84	<100	<10	<1	1	2	<.01	570	2	<10

Table 5.--Trace constituents and compounds--Continued

Manganese, total recoverable (µg/L as Mn)	Mercury total recoverable (µg/L as Hg)	Molybdenum, total recoverable (µg/L as Mo)	Strontium, total recoverable (µg/L as Sr)	Uranium dissolved, extraction (µg/L)	Uranium natural dissolved (µg/L as U)	Vanadium, dissolved (µg/L as V)	Zinc, total recoverable (µg/L as Zn)	Carbon organic total (mg/L as C)	Carbon, organic dissolved (mg/L as C)	Oil and grease, total recov. gravimetric (mg/L)	Cobalt, total recoverable (µg/L as Co)
10	<.1	3	260	--	1.1	<1	10	1.3	--	--	<1
30	<.1	<1	20	.08	--	1	20	2.0	--	--	1
--	--	--	--	--	--	--	--	---	15	--	--
430	.1	<1	140	--	.8	<1	10	5.1	--	--	7
--	--	--	--	--	--	--	--	---	10	<1	--
30	<.1	<1	110	--	.9	<1	10	.90	--	--	1
20	<.1	<1	100	--	1.0	<1	10	1.4	--	--	<1
--	--	--	--	--	--	--	--	---	2.0	--	--
20	<.1	<1	30	--	.9	1	10	.60	--	--	5
<10	<.1	<1	10	--	.7	<1	30	.70	--	--	<1
20	<.1	<1	20	--	.7	<1	40	.60	--	--	2
20	<.1	<1	40	--	1.4	<1	20	.80	--	--	3
10	.1	<1	50	.11	--	<1	30	.70	--	--	1
1000	<.1	11	770	--	1.0	<1	20	.40	--	--	10
50	<.1	32	230	--	2.5	30	20	.70	--	--	1
10	.2	1	30	--	1.0	<1	20	1.9	--	--	<1
--	--	--	--	--	--	--	--	---	4.4	--	--
10	<.1	<1	10	.08	--	--	10	.80	--	--	<1
10	<.1	<1	20	--	.8	<1	30	.60	--	--	6
10	.1	<1	30	--	.9	<1	20	.50	--	--	5
<10	<.1	1	40	.17	--	--	60	.60	--	--	<1
10	<.1	<1	20	--	.8	1	10	.70	--	--	1
11000	4.5	<1	250	--	16	<1	90	21	--	--	30
--	--	--	--	--	--	--	--	---	4.1	4	--
80	<.1	<1	30	--	1300	<1	20	2.2	--	--	--
--	--	--	--	--	--	--	--	---	3.2	--	--
80	<.1	<1	30	.40	--	<1	20	2.3	--	--	3
--	--	--	--	--	--	--	--	---	5.0	--	--
5900	.1	<1	1100	1.0	--	<1	40	2.3	--	--	20
2900	.1	<1	720	--	190	<1	30	2.7	--	--	10
--	--	--	--	--	--	--	--	---	1.3	<1	--
<10	<.1	<1	20	--	.8	<1	10	.50	--	--	<1
40	.2	<1	120	--	110	<1	20	.90	--	--	4
430	.2	1	210	--	180	<1	10	2.0	--	--	<1
--	--	--	--	--	--	--	--	---	3.4	--	--
10	.2	1	70	--	61	<1	50	.80	--	--	<1
250	.2	<1	120	--	140	<1	30	1.5	--	--	6
20	<.1	<1	60	--	68	<1	20	1.1	--	--	1
--	--	--	--	--	--	--	--	---	2.5	--	--
10	.1	<1	30	.23	--	<1	20	.80	--	--	2
10	<.1	1	20	.02	--	<1	20	1.5	--	--	<1
--	--	--	--	--	--	--	--	---	1.7	<1	--
20	<.1	<1	20	.05	--	<1	20	1.4	--	--	3
10	<.1	<1	20	.01	--	<1	20	1.1	--	--	4
30	<.1	<1	--	<.01	--	1	20	1.3	--	--	<1

Table 6.--Radiochemicals

Site number	Date of sample	Gross alpha, dissolved (µg/L as U-NAT)	Gross alpha, susp. total (µg/L as U-NAT)	Gross beta, dissolved (pCi/L) as Cs-137)	Gross beta, dissolved (pCi/L) as Sr/Y -90)	Gross beta, susp. total (pCi/L as Cs-137)	Gross beta, susp. total (pCi/L) as Sr/Y -90)
7.30	4/12/84	<5.0	0.6	3.1	<2.7	0.7	0.7
5.14	4/12/84	<2.3	.9	<1.4	<1.2	.8	.7
3.5	4/12/84	<4.6	2.4	<2.6	<2.2	1.9	1.7
2.2	4/13/84	2.6	<.4	1.3	1.2	<.5	<.4
18.15	4/12/84	<13	39	7.1	6.1	29	25
9.63	4/13/84	160	10	320	280	49	44
9.60	4/13/84	<3.5	1.2	<1.8	<1.6	.9	.8
9.47	4/12/84	94	3.7	61	53	37	34
9.46	4/12/84	20	1.2	19	16	11	9.9
14.3	4/12/84	<.9	<.4	2.2	1.9	<.4	<.4

REFERENCES

Evaldi, R. D., 1984, Streamflow and specific conductance data for selected sites, February 15 through April 9, 1984, near the Y-12 Plant, the Oak Ridge Reservation, Tennessee: U.S. Geological Survey Open-File Report 84-625, 5 p.

Goerlitz, D. F., and Brown, Eugene, 1972, Methods for analysis of organic substances in water: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. A3, 40 p.

McMaster, W. M., 1967, Hydrologic data for the Oak Ridge area Tennessee: U.S. Geological Survey Water-Supply Paper 1839-N, 60 p.

Miller, R. A., 1974, The geologic history of Tennessee: Tennessee Division of Geology Bulletin 74, 63 p.

Skougstad, M. W., Fishman, M. J., Friedman, L. C., Erdmann, D. E., and Duncan, S. S., eds., 1979, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. A1, 626 p.

Thacker, L. L., Janzer, V. J., and Edwards, K. W., 1977, Methods for determination of radioactive substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. A5, 95 p.